

FINAL REPORT  
JULY 1997

REPORT NO. 97-04

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2.75-INCH, HYDRA 70, PA150,  
ROCKET PALLET FIRST ARTICLE  
TESTING (FAT)

Prepared for:  
U.S. Army Armament Research, Development  
and Engineering Center  
ATTN: AMSTA-AR-ESK  
Rock Island, IL 61299-7300

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VALIDATION ENGINEERING DIVISION  
SAVANNA, ILLINOIS 61074-9639

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19. ABSTRACT (Continue on reverse if necessary and identify by block number)  The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SIOAC-DEV), was tasked by the U.S. Army Armament Research, Development and Engineering Center (ARDEC) to conduct first article MIL-STD-1660, Design Criteria for Ammunition Unit Loads, testing on the 2.75-inch, Hydra 70, PA150, rocket pallet produced by Delfasco of Tennessee, Greeneville, TN. Results from the MIL-STD-1660 testing indicated that the pallet, adapters, and containers produced by Delfasco met MIL-STD-1660 test requirements.					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION <b>UNCLASSIFIED</b>		
22a. NAME OF RESPONSIBLE INDIVIDUAL JEROME H. KROHN			22b. TELEPHONE (Include Area Code) 815-273-8929		22c. OFFICE SYMBOL SIOAC-DEV

U.S. ARMY DEFENSE AMMUNITION CENTER  
VALIDATION ENGINEERING DIVISION  
SAVANNA, IL 61074-9639

REPORT NO. 97-04

2.75-INCH, HYDRA 70, PA150, ROCKET PALLET FIRST ARTICLE TESTING (FAT)

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## PART 1

### INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SIOAC-DEV), was tasked by the U.S. Army Armament Research, Development and Engineering Center (ARDEC) to conduct first article MIL-STD-1660, Design Criteria for Ammunition Unit Loads, testing on the 2.75-inch, Hydra 70, PA150, rocket pallet produced by Delfasco of Tennessee, Greeneville, TN.

B. AUTHORITY. This test was conducted IAW mission responsibilities delegated by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL. Reference is made to the following:

1. Change 4, 4 October 1974, to AR740-1, 23 April 1973, Storage and Supply Activity Operation.

2. AMCCOM-R, 10-17, Mission and Major Functions of USADACS, 13 January 1986.

C. OBJECTIVE. The objective of the tests was to determine if the pallets produced by Delfasco met MIL-STD-1660 test requirements prior to the acceptance of the pallets by the U.S. Army (USA).

D. CONCLUSION. Two of the three pallets submitted by Delfasco were evaluated using MIL-STD-1660 test requirements. No significant flaws were found in the two pallets during testing so the third pallet was not evaluated. As a result of the performance of the pallets during testing, the 2.75-inch, Hydra 70, PA150, rocket pallet produced by Delfasco is recommended for USA-wide use.

## PART 2

MARCH - AUGUST 1996

### ATTENDEES

Quinn D. Hartman  
General Engineer  
DSN 585-8992  
815-273-8992

Director  
U.S. Army Defense Ammunition Center  
ATTN: SIOAC-DEV  
3700 Army Depot Road  
Savanna, IL 61074-9639

Jerry H. Krohn  
Supervisory General Engineer  
DSN 585-8908  
815-273-8908

Director  
U.S. Army Defense Ammunition Center  
ATTN: SIOAC-DEV  
3700 Army Depot Road  
Savanna, IL 61074-9639

Thomas J. Michels  
Supervisory General Engineer  
DSN 585-8080  
815-273-8080

Director  
U.S. Army Defense Ammunition Center  
ATTN: SIOAC-DES  
3700 Army Depot Road  
Savanna, IL 61074-9639

Mark Rehmstedt  
Packaging Engineer  
DSN 493-8206  
309-782-8206

U.S. Army Armament Research, Development  
and Engineering Center  
ATTN: AMSTA-AR-ESK  
Rock Island, IL 61299-7300

## PART 3

### TEST PROCEDURES

The test procedures outlined in this section were extracted from MIL-STD-1660, Design Criteria for Ammunition Unit Loads, 8 April 1977. This standard identifies nine steps that a unitized load must undergo if it is to be considered acceptable. The four tests that were conducted on the test pallets are summarized below.

A. STACKING TEST. The unit load was loaded to simulate a stack of identical unit loads stacked 16 feet high, for a period of one hour. This stacking load was simulated by subjecting the unit load to a compression weight equal to an equivalent 16-foot stacking height. The compression load was calculated in the following manner. The unit load weight was divided by the unit load height in inches and multiplied by 192. The resulting number was the equivalent compressive force of a 16-foot-high load.

B. REPETITIVE SHOCK TEST. The repetitive shock test was conducted IAW Method 5019, Federal Standard 101. The test procedure is as follows: The test specimen was placed on, but not fastened to, the platform. With the specimen in one position, the platform was vibrated at 1/2-inch amplitude (1-inch double amplitude) starting at a frequency of approximately 3 cycles per second. The frequency was steadily increased until the package left the platform. The resonant frequency was achieved when a 1/16-inch-thick feeler gage momentarily slid freely between every point on the specimen in contact with the platform at some instance during the cycle or a platform acceleration achieved  $1 \pm 0.1$  Gs. Midway into the testing period, the specimen was rotated 90 degrees and the test continued for the duration. Unless failure occurred, the total time of vibration was two hours if the specimen was tested in one position and three hours for more than one position.

**C. EDGEWISE ROTATIONAL DROP TEST.** This test was conducted using the procedures of Method 5008, Federal Standard 101. The procedure for the edgewise rotational drop test is as follows: The specimen was placed on its skids with one end of the pallet supported on a beam 4-1/2 inches high. The height of the beam was increased if necessary to ensure that there was no support for the skids between the ends of the pallet when dropping took place, but was not high enough to cause the pallet to slide on the supports when the dropped end was raised for the drops. The unsupported end of the pallet was then raised and allowed to fall freely to the concrete, pavement, or similar underlying surface from a prescribed height. Unless otherwise specified, the height of drop for level A protection conforms to the following tabulation:

GROSS WEIGHT (WITHIN RANGE LIMITS) (Pounds)	DIMENSIONS OF ANY EDGE, HEIGHT OR WIDTH (WITHIN RANGE LIMITS) (Inches)	HEIGHT OF DROPS ON EDGES	
		Level A (Inches)	Level B (Inches)
150 - 250	60 - 66	36	27
250 - 400	66 - 72	32	24
400 - 600	72 - 80	28	21
600 - 1,000	80 - 95	24	18
1,000 - 1,500	95 - 114	20	16
1,500 - 2,000	114 - 144	17	14
2,000 - 3,000	Above 145 - No limit	15	12
Above - 3,000		12	9

**D. INCLINE-IMPACT TEST.** This test was conducted by using the procedure of Method 5023, Incline-Impact Test of Federal Standard 101. The procedure for the incline-impact test is as follows: The specimen was placed on the carriage with the surface or edge to be impacted



projecting at least 2 inches beyond the front end of the carriage. The carriage was brought to a predetermined position on the incline and released. If it was desired to concentrate the impact on any particular position on the container, a 4- by 4-inch timber was attached to the bumper in the desired position before the test. No part of the timber was struck by the carriage. The position of the container on the carriage and the sequence in which surfaces and edges were subjected to impacts was at the option of the testing activity and depends upon the objective of the tests. This test was to determine satisfactory requirements for a container or pack, and, unless otherwise specified, the specimen was subjected to one impact on each surface that has each dimension less than 9.5 feet. Unless otherwise specified, the velocity at time of impact was 7 feet per second.

## PART 4

### TEST EQUIPMENT

#### A. Compression Tester.

- |                       |                      |
|-----------------------|----------------------|
| 1. Manufacturer:      | Ormond Manufacturing |
| 2. Platform:          | 60- by 60-inches     |
| 3. Compression Limit: | 50,000 pounds        |
| 4. Tension Limit:     | 50,000 pounds        |

#### B. Transportation Simulator.

- |                  |                    |
|------------------|--------------------|
| 1. Manufacturer: | Gaynes Laboratory  |
| 2. Capacity:     | 6,000-pound pallet |
| 3. Displacement: | 1/2-inch amplitude |
| 4. Speed:        | 50 to 400 rpm      |
| 5. Platform:     | 5- by 8-foot       |

#### C. Inclined Plane.

- |                  |                    |
|------------------|--------------------|
| 1. Manufacturer: | Conbur Incline     |
| 2. Type:         | Impact Tester      |
| 3. Grade:        | 10 percent incline |
| 4. Length:       | 12-foot            |

## PART 5

### TEST RESULTS

Two of three pallets submitted by Delfasco of Tennessee were inertly loaded to the specified design weight using two 4- by 4-inch lengths of lumber, two 2- by 4-inch lengths of lumber, and a quantity of ammunition simulant to bring each container individually to the required weight. Special care was taken to ensure that each container had the proper amount of weight in order to achieve a realistic pallet center of gravity (CG). Once properly prepared, the first two pallets were tested using MIL-STD-1660, Design Criteria for Ammunition Unit Loads, requirements. As a result of the good performance of the pallets during testing, the third pallet submission was not tested.

#### A. PALLET NO. 1.

Date:	19 November 1996
Weight:	2,245 pounds
Length:	78-1/2 inches
Width:	29-3/8 inches
Height:	43-1/2 inches

1. Compression Test. The test pallet was compressed with a load force of 9,900 pounds for 60 minutes. No damage was noted as a result of this test.

2. Repetitive Shock Test. The test pallet was vibrated 90 minutes at 220 RPM in the longitudinal orientation and 90 minutes at 185 RPM in the lateral orientation. Small cracks were noted to have formed in the pallet posts next to the pallet skids at the completion of the longitudinal vibration test. No change in the cracks was noted after the lateral vibration.

3. Edgewise Rotational Drop Test. The test pallet was edgewise rotationally dropped from a height of 15-inches on the longitudinal and lateral drops. No additional cracking was noted in the pallet posts.

4. Sling Compatibility Test. The test pallet was lifted off of the ground using the toplift adapter by four points, three points, two diagonal points, two adjacent points, and one point. No shifting of the containers or permanent deformation of the toplift adapter was noted.

5. Incline-Impact Test. The test pallet was incline-impacted on all four sides from a height of 8 feet. No additional damage was noted at the completion of the test.

6. Post Test Inspection. Following completion of MIL-STD-1660 testing, the pallet was disassembled and inspected for additional damage. The cracks noted at the completion of the longitudinal vibration test had not increased significantly. No significant damage was noted in the top or bottom adapters or the pallet deck.

#### B. PALLET NO. 2.

Date:	20 November 1996
Weight:	2,245 pounds
Length:	78-1/2 inches
Width:	29-3/8 inches
Height:	43-1/2 inches

1. Compression Test. The test pallet was compressed with a load force of 9,900 pounds for 60 minutes. No damage was noted as a result of this test.

2. Repetitive Shock Test. The test pallet was vibrated 90 minutes at 220 rpm in the longitudinal orientation and 90 minutes at 155 rpm in the lateral orientation. Three small cracks were noted to have formed in the pallet posts next to the pallet skids at the completion of the longitudinal vibration test. Following completion of the lateral vibration, the cracks were noted

to have increased in size and extended from the edge of the skid up to the strengthening dimple in the pallet post.

3. Edgewise Rotational Drop Test. The test pallet was edgewise rotationally dropped from a height of 15 inches on the longitudinal and lateral drops. No additional cracking was noted in the pallet posts.

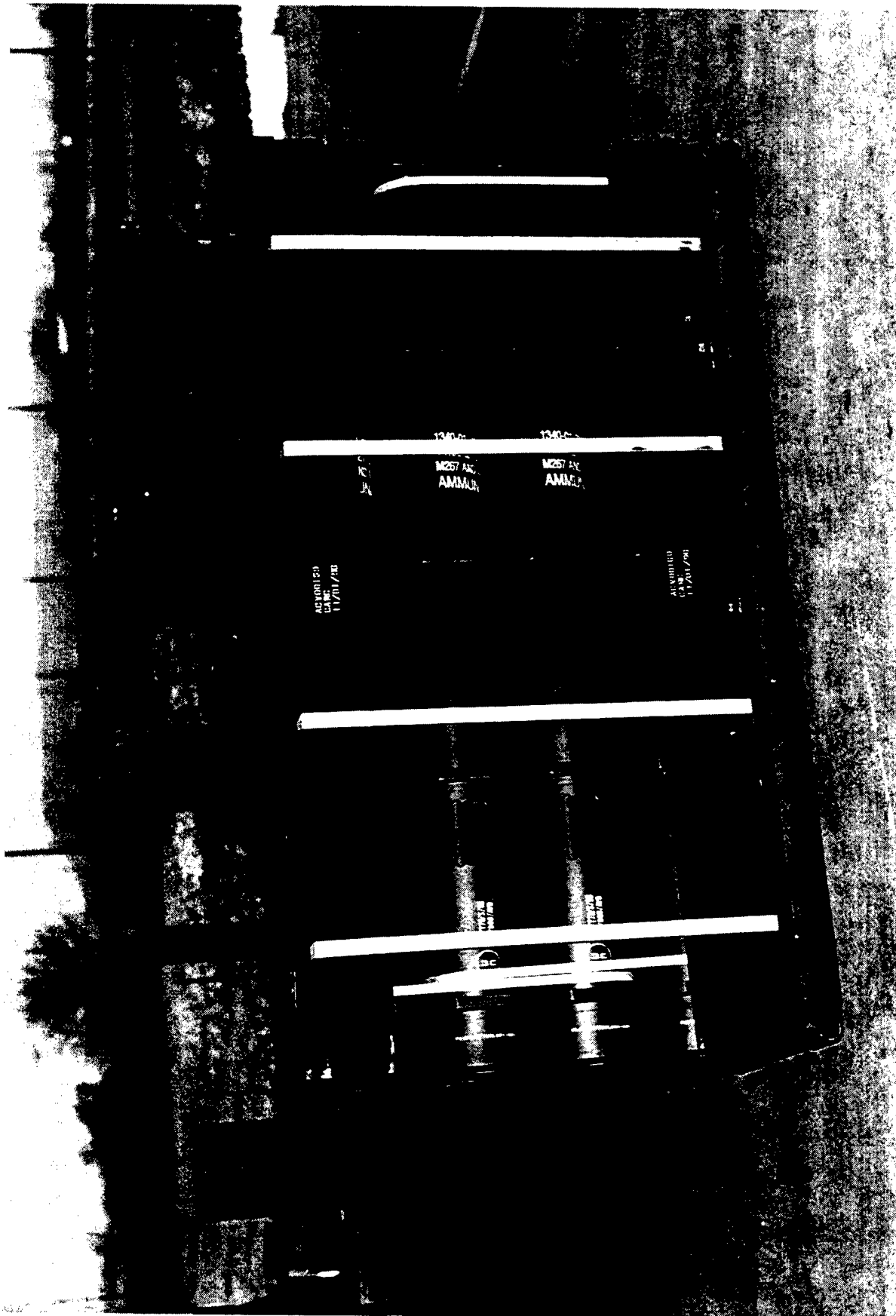
4. Sling Compatibility Test. The test pallet was lifted off of the ground using the toplift adapter by four points, three points, two diagonal points, two adjacent points, and one point. No shifting of the containers or permanent deformation of the toplift adapter was noted.

5. Incline-Impact Test. The test pallet was incline-impacted on all four sides from a height of 8 feet. No additional damage was noted at the completion of the test.

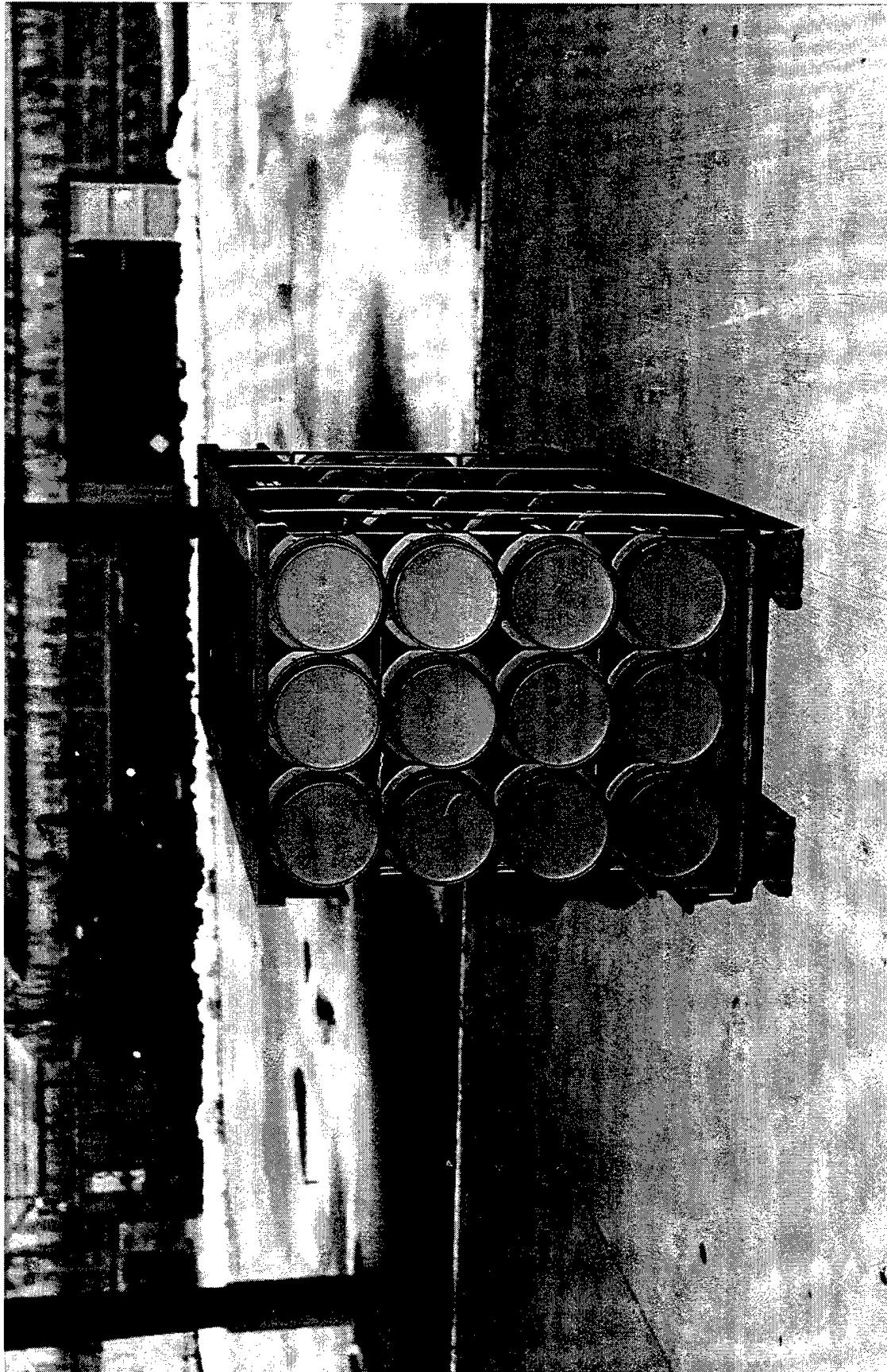
6. Post Test Inspection. Following completion of MIL-STD-1660 testing, the pallet was disassembled and inspected for additional damage. The cracks noted at the completion of the vibration test had not increased significantly. No significant damage was noted in the top or bottom adapters and only minor deformation was noted on the pallet deck.

**PART 6**

**PHOTOGRAPHS**



	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
PHOTO NO. A0317-SCN-97-1159. This photograph shows the side view of one of the three pallets submitted by Delfasco of Tennessee.		



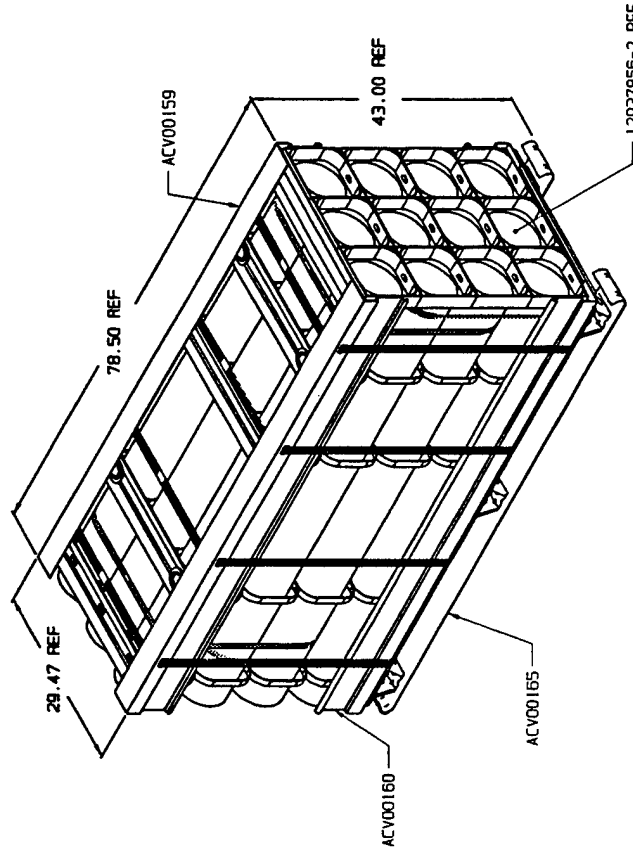
	U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
PHOTO NO. A0317-SCN-97-1163. This photograph shows the end view of one of the three pallets submitted by Delfasco of Tennessee.		



**PART 7**

**DRAWINGS**

REVISION		DATE	APPROVED
PRODUCT BASELINE	94-03-25	94-03-25	SCHULTZ
ERR MAR2001	95-06-22	95-06-22	
A MFR 1613003	95-06-22	95-06-22	
(ECP MFR3004)	95-02-22	95-02-22	

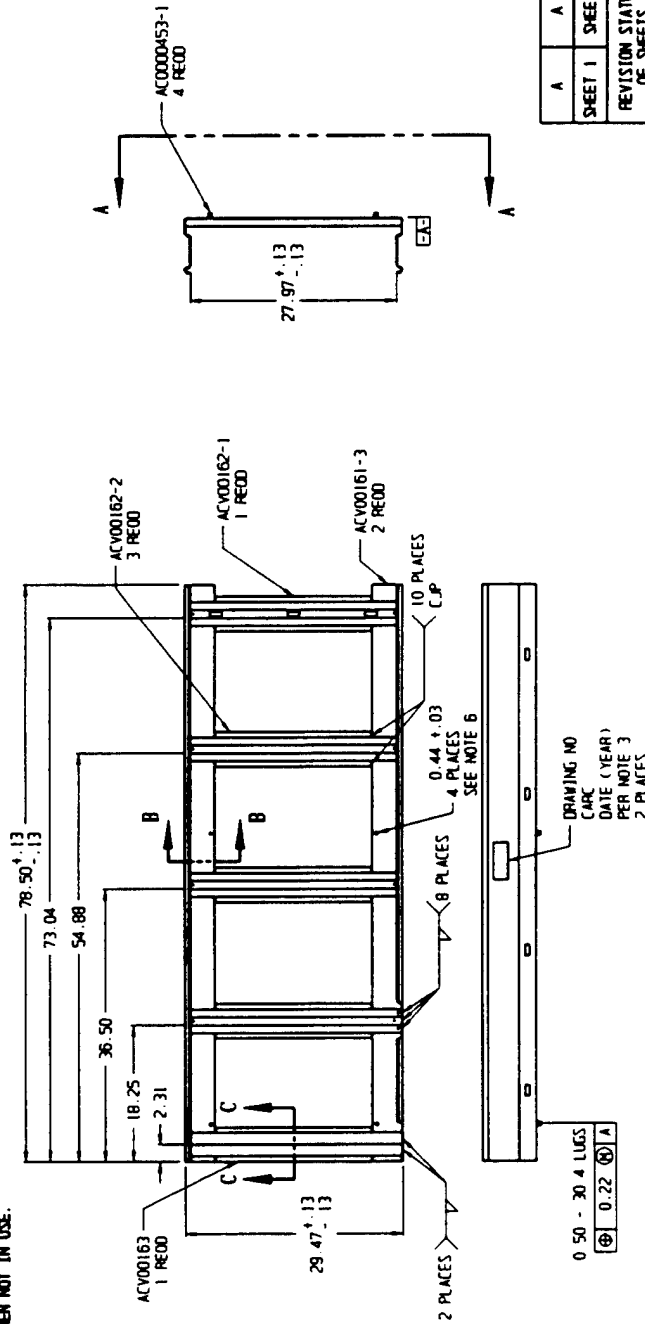


COMBINATION OF ADOPTED ITEMS	PART NO
PALLET - SPECIAL SIZE 78.50 X 29.31 SHEET METAL	ACV00165
TOP ASSEMBLY - PALLET ADAPTER PA150 CONTAINER	ACV00159
BOTTOM ASSEMBLY - PALLET ADAPTER PA150 CONTAINER	ACV00160
UNITIZATION DRAWING	19-48-4231/61- 20PM1006

DISTRIBUTION STATEMENT A.  
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DESIGN ACTIVITY		94-03-25		B.K. S.M. SCHULTZ		U.S. ARMY CORP. COMMAND ARMED SERVICES CENTER STANFORD, ILLINOIS 61840-9030	
COMBINATION OF ADOPTED ITEMS, PALLET AND PALLET ADAPTER, UNITIZATION OF PA150 CONTAINER		SIZE CODE		B 28820		ACV00156	
NEXT ASST USED ON		2.75 HIDEA PROJECT		APPLICATION		SCALE 1/8" = 1'-0"	
SHEET 1 OF 1		UNIT WT		SHEET 1 OF 1			

- NOTES:
1. MIL-A-2550, AMS/ANS A2.4-88, ANSI Y14.5M-1982 AND MIL-A-20789 APPLY.
  2. PROTECTIVE FINISH SHALL BE IN ACCORDANCE WITH DNG AC20000423. COLOR SHALL BE GREEN NO 383 PER MIL-C-48168 (FED STD 595 NO 34094).
  3. MARKING PAINT SHALL BE IN ACCORDANCE WITH DNG AC20000423.
  4. COLOR SHALL BE WHITE NO 37875 0.50 INCH HIGH LETTERS.
  5. WELDMENT CONSTRUCTION SPEC MIL-STD-1281, CLASS 1, APPLIES.
  6. CHAMFERED CORNER SHALL NOT BE WELDED IN ORDER TO ALLOW ADDITIONAL DRAIN HOLE.
  7. ALTERNATE ALIGNING LUG PART NO AC20000453-3 MAY BE USED INSTEAD OF PART NO AC20000453-1. IF ALTERNATE LUG IS USED, USE 0.52 4 PLACES.
  8. DIMENSIONS OF THE RETAINER RING MAY BE VARIED TO INSURE THE RING'S POSITION WHEN LIFTED VERTICALLY. THIS DIMENSION ASSURES AND 95 DEGREES WITH THE HORIZONTAL. THIS DIMENSION ASSURES THAT THE RING SHALL BE SELF NESTING WHEN NOT IN USE.



A	A
SHEET 1	SHEET 2
REVISION STATUS	OF SHEETS

PART NO ACV00159

DESIGN ACTIVITY	94-03-25	DATE	94-03-25
DESIGNER	B.K. SCHULTZ	DESIGNED BY	B.K. SCHULTZ
CHECKED BY	J.S. JAK	CHECKED BY	J.S. JAK
APPROVED BY	V.F. ERNST	APPROVED BY	V.F. ERNST
DATE	94-03-25	DATE	94-03-25
TIME	10:00	TIME	10:00
LOCATION	WILLIAM F. ERNST	LOCATION	WILLIAM F. ERNST
SCALE	1/8	SCALE	1/8
SHEET NO	1	SHEET NO	1
TOTAL SHEETS	2	TOTAL SHEETS	2
APPLICATION	ACV00159	APPLICATION	ACV00159
REVISION	1	REVISION	1
REVISION	2	REVISION	2
REVISION	3	REVISION	3
REVISION	4	REVISION	4
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REVISION	100	REVISION	100

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REVISION		DATE	APPROVED
-	PRODUCT BASELINE	94-03-25	SCHULTZ
A	NR 161303 (ECP 161304)	95-06-22	
	(ECP 161304)	95-02-22	
	(ECP 161304)	95-03-18	

RING OMITTED FOR CLARITY

2.81 REF  
SEE NOTE 7

4 PLACES

4 PLACES

4 PLACES

ACV00161-3  
REF

20 PLACES

REF  
C.P.

ACV00162-2  
REF

4 PLACES

SEE NOTE 5

SECTION B-B

SCALE 1/2

AC20000806-2  
4 REOD

AC20000804  
4 REOD

3.00

34.25

5.00

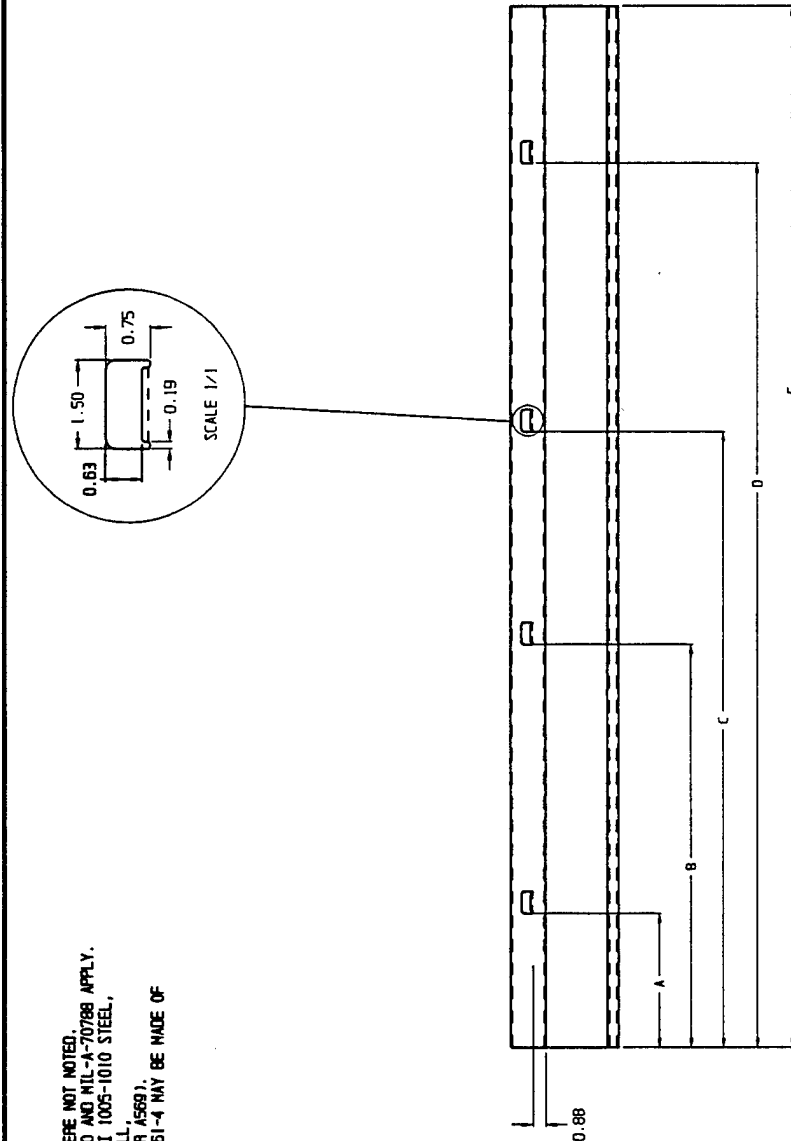
VIEW A-A

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DESIGN ACTIVITY		U.S. ARMY ARMED FORCES CENTER FORT MONROE, VIRGINIA 22061-5000	
DATE	94-03-25	DESIGNER	SCHULTZ
BY	JS JHK	DESIGNED BY	T. J. NICHOLS
CHKD BY	N. F. ERNST	CHKD BY	N. F. ERNST
APPROVED BY	WILLIAM F. ERNST	APPROVED BY	WILLIAM F. ERNST
TOP ASSEMBLY- PALLET ADAPTER		PALLET CONTAINER	
ACV00159		ACV00159	
SCALE 1/4		UNIT BT	
SHEET 1/4		SHEET 2 OF 2	



REVISION		DATE	APPROVED
- PRODUCT BASELINE		94-03-25	SCHULTZ
- FOR MAR2001		95-06-22	
- FOR MAR2003		95-06-22	



- NOTES:
1. BEND RADIUS 0.13 INCH MAX WHERE NOT NOTED.
  2. ANSI Y14.5M-1982, MIL-A-2550 AND MIL-A-70788 APPLY.
  3. MATERIAL: SHEET, SAE OR ANSI 1005-1010 STEEL, CARBON, COLD ROLL OR HOT ROLL, PER ASTM A568, (ASTM A366 OR A569).
  4. PARTS ACV00161-2 AND ACV00161-4 MAY BE MADE OF 12 GA (.101) MATERIAL.

DIMENSION				
PART NO	A	B	C	E
ACV00161-1	9.75	24.75	44.50	59.50
ACV00161-2	---	---	---	70.75
ACV00161-3	9.00	27.08	49.92	68.00
ACV00161-4	---	---	---	78.50

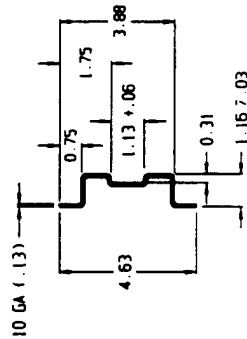
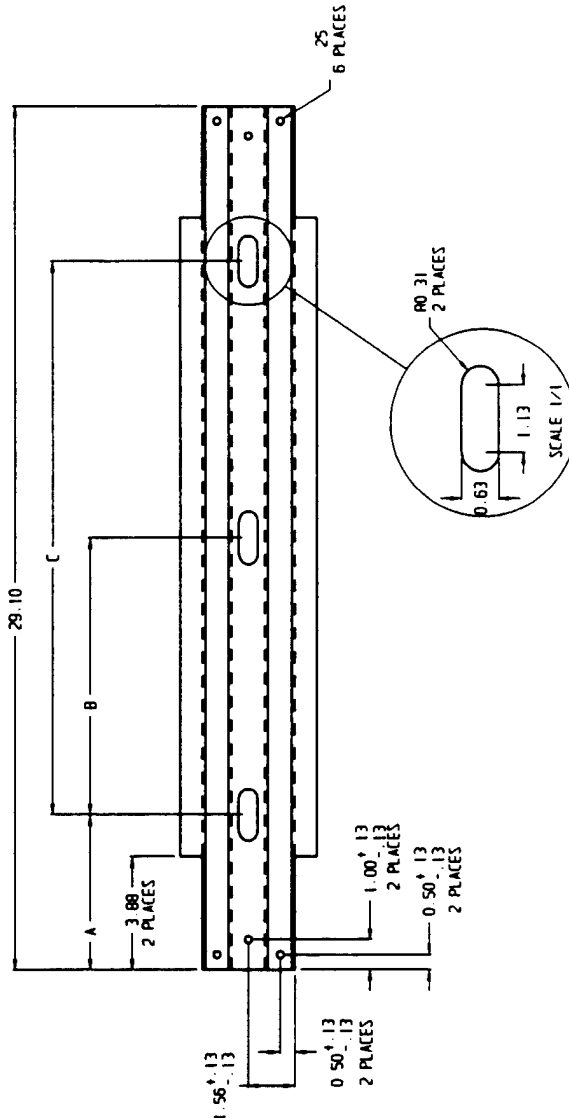
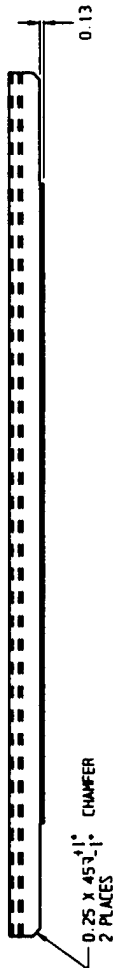
SEE PARTS LIST

DESIGN ACTIVITY		DATE	
B.K. SCHULTZ		94-03-25	
J.S. JAK		J.J. MICHELS	
WILLIAM F. ERNST		WILLIAM F. ERNST	
SCALE 1/2		UNIT IN	
SHEET 12		SHEET OF	

DISTRIBUTION STATEMENT A.  
APPROVED FOR PUBLIC RELEASE;  
DISTRIBUTION IS UNLIMITED.

NOTES:

1. BEND RADIUS 0.13 INCH MAX WERE NOT NOTED.
2. ANSI Y14.5M-1982, MIL-A-2550 AND MIL-A-70788 APPLY.
3. MATERIAL: SHEET, SAE OR ANSI 1005-1010 STEEL, CARBON, COLD ROLL OR HOT ROLL, PER ASTM A568, (ASTM A368 OR A568).



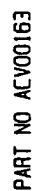
DIMENSION			
PART NO	A	B	C
ACV00162-1	5.30	9.25	18.50
ACV00162-2	----	----	----

SEE PARTS LIST

PART NO ACV00162-1		PART NAME SQUARE RING RESTRAINT	
QTY 1		UNIT EACH	
DATE 94-03-25		DRAWN BY J. J. NICHOLS	
CHECKED BY W. F. ERNST		APPROVED BY WILLIAM F. ERNST	
TITLE SQUARE RING RESTRAINT		SCALE 1/2	
APPLICATION SQUARE RING RESTRAINT		SHEET NO ACV00162	

DISTRIBUTION STATEMENT A.  
 APPROVED FOR PUBLIC RELEASE;  
 DISTRIBUTION IS UNLIMITED.

1. BEND RADIUS 0.13 INCH MAX WHERE NOT NOTED.
2. ANSI Y14.5M-1982. MIL-A-2550 AND MIL-A-70788 APPLY.
3. MATERIAL: SHEET, SAE OR ANSI 1005-1010 STEEL, CARBON, COLD ROLL OR HOT ROLL, PER ASTM A568, (ASTM A366 OR A569).

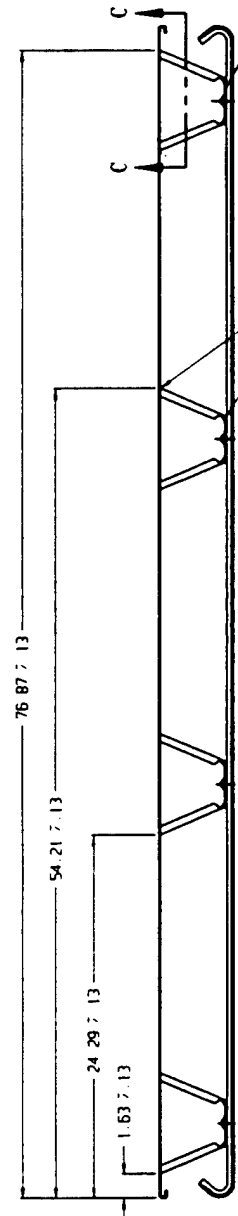
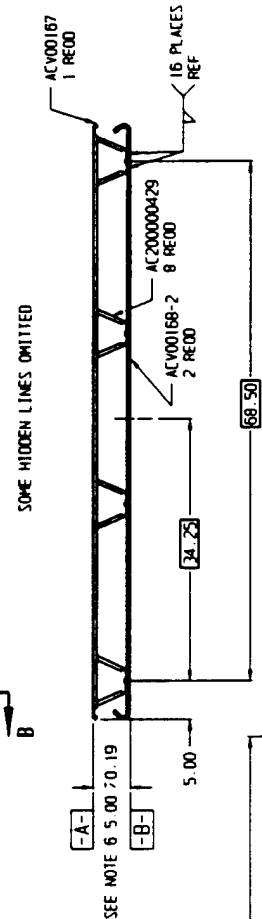
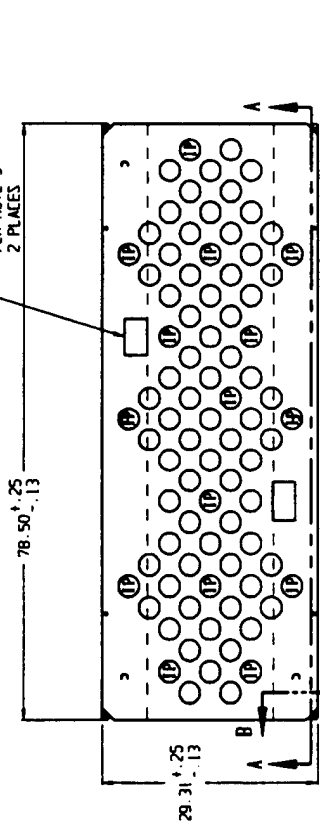
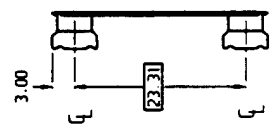
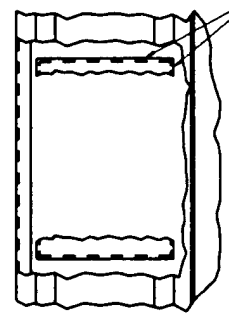
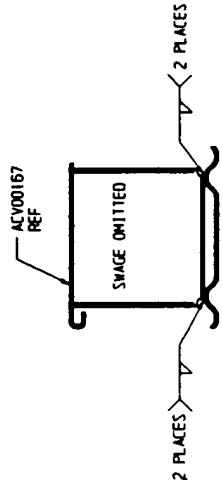


APPROVED FOR PUBLIC RELEASE;  
DISTRIBUTION IS UNLIMITED.

[illegible]



- NOTES:
1. MIL-A-2550, MS1/MS A2.4-66, MS1 V14.34-1982 AND MIL-P-70786 APPLY.
  2. PROTECTIVE FINISH SHALL BE IN ACCORDANCE WITH DNG AC200000423. COLOR SHALL BE GREEN NO 383 PER MIL-C-46168 (FED STD 595 NO 34094).
  3. MARKING PAINT SHALL BE IN ACCORDANCE WITH DNG AC200000423. COLOR SHALL BE WHITE NO 37875 0.50 INCH HIGH LETTERS.
  4. WELDMENT CONSTRUCTION SPEC MIL-STD-1201, CLASS 1, APPLIES.
  5. MAXIMUM GAP ALONG WELD LINE BETWEEN POST AND DECK OR POST AND SKID WILL NOT EXCEED 0.02 INCHES PRIOR TO WELDING. THIS MAY BE CHECKED WHEN RESTRAINED BY UP TO 1500 LBS UNIFORMLY APPLIED TO THE TOP SURFACE OF THE DECK.
  6. THIS DIMENSION IS TO BE CHECKED AT THE INSPECTION POINTS (IP) DEFINED IN THE TOP VIEW. THE MEASUREMENTS WILL ORIGINATE FROM DATUMS A AND B.



PART NO ACV00165

REVISION		DATE		APPROVED	
PRODUCT BASE LINE		94-03-25		SCHULTZ	
FOR MFG		95-08-22			
FOR MFG		96-04-11			

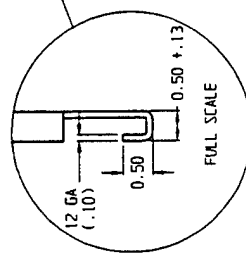
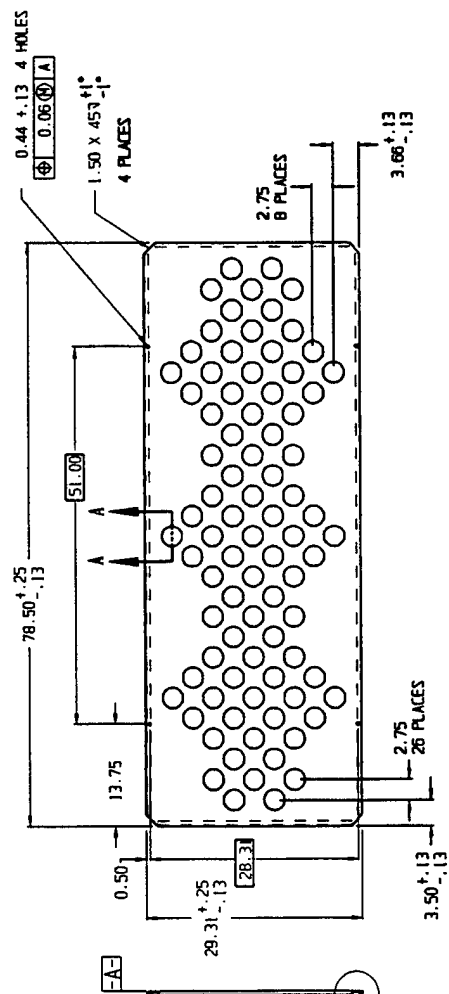
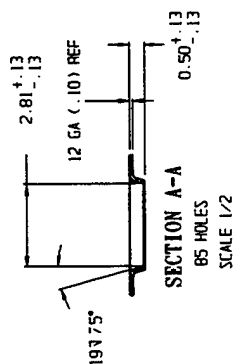
DESIGN ACTIVITY	DATE	BY	CHKD	APP'D	REMARKS
DESIGN	94-03-25	W.F. ERNST	T.J. NICHOLS		
DETAIL					
ASSEMBLY					
TEST					
INSTRUMENT					
REVISION					

PALLET-SPECIAL SIZE	78.50 X 29.31
SHEET METAL	
TEST CODE	28620
TEST CODE	ACV00165
SCALE	1/8
UNIT	IN
SHEET	1 OF 1

DISTRIBUTION STATEMENT A:  
APPROVED FOR PUBLIC RELEASE;  
DISTRIBUTION IS UNLIMITED.

- NOTES:
1. BEND RADIUS 0.13 INCH MAX WHERE NOT NOTED.
  2. ANSI Y14.54-1982, MIL-A-2550 AND MIL-P-70786 APPLY.
  3. MATERIAL: SHEET, SAE OR ANSI 1005-1010 STEEL, CARBON, COLD ROLL OR HOT ROLL, PER ASTM A568, (ASTM A366 OR A569).



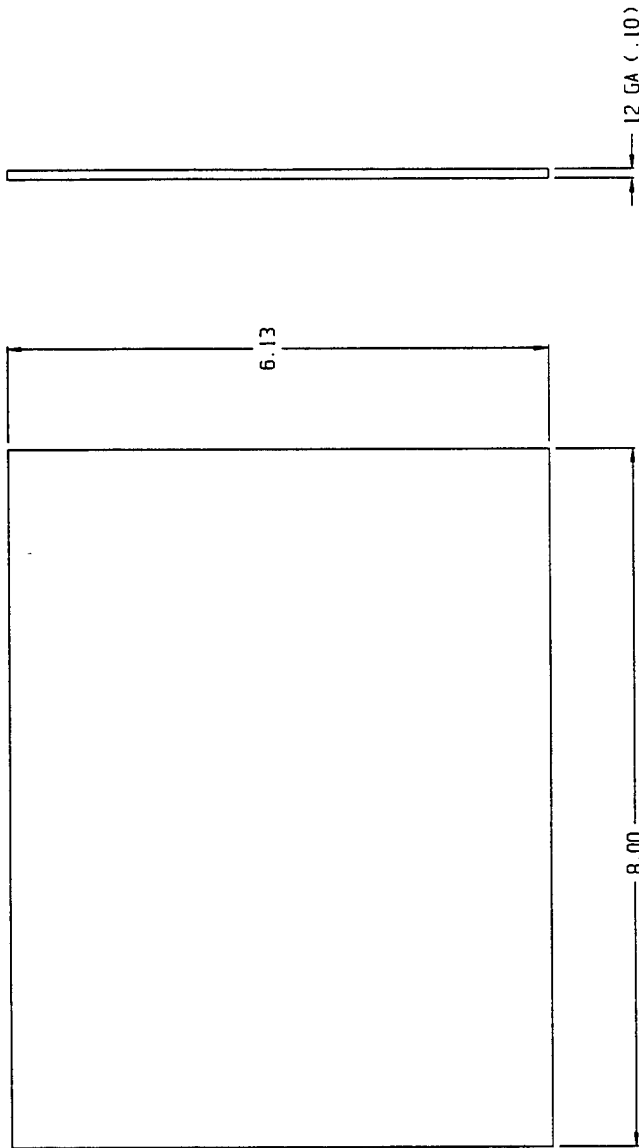
PART NO ACV00167

DESIGN ACTIVITY		DESIGN ACTIVITY		DESIGN ACTIVITY	
DATE	94-03-25	DATE	94-03-25	DATE	94-03-25
BY	BJK	BY	SMS	BY	SMS
CHECKED	JS	CHECKED	T.J. NICHOLS	CHECKED	T.J. NICHOLS
APPROVED	W.F. ERNST	APPROVED	W.F. ERNST	APPROVED	W.F. ERNST
PART NAME		PART NAME		PART NAME	
ACV00167		ACV00167		ACV00167	
NEXT ASSY		NEXT ASSY		NEXT ASSY	
USED ON		USED ON		USED ON	
APPLICATION		APPLICATION		APPLICATION	
2.75 HYPRA		2.75 HYPRA		2.75 HYPRA	
POCKET		POCKET		POCKET	
SHEET METAL		SHEET METAL		SHEET METAL	
SIZE 78.50 X 29.31		SIZE 78.50 X 29.31		SIZE 78.50 X 29.31	
CODE 28620		CODE 28620		CODE 28620	
UNIT 1/2		UNIT 1/2		UNIT 1/2	
SHEET 1 OF 1		SHEET 1 OF 1		SHEET 1 OF 1	

DISTRIBUTION STATEMENT A:  
APPROVED FOR PUBLIC RELEASE;  
DISTRIBUTION IS UNLIMITED.



- NOTES:
1. ANSI Y14.5M-1982, MIL-A-2550 AND MIL-P-70786 APPLY.
  2. MATERIAL: SHEET, SAE OR ANSI 1005-1010 STEEL, CARBON, COLD ROLL OR HOT ROLL, PER ASTM A568, (ASTM A366 OR A569).



PART NO ACV00307

DISTRIBUTION STATEMENT A.

APPROVED FOR PUBLIC RELEASE;  
DISTRIBUTION IS UNLIMITED.

REVISION			
LTR	DESCRIPTION	DATE	APPROVED
-	PRODUCT BASELINE ERR 000000	YY-MM-DD	YY-MM-DD

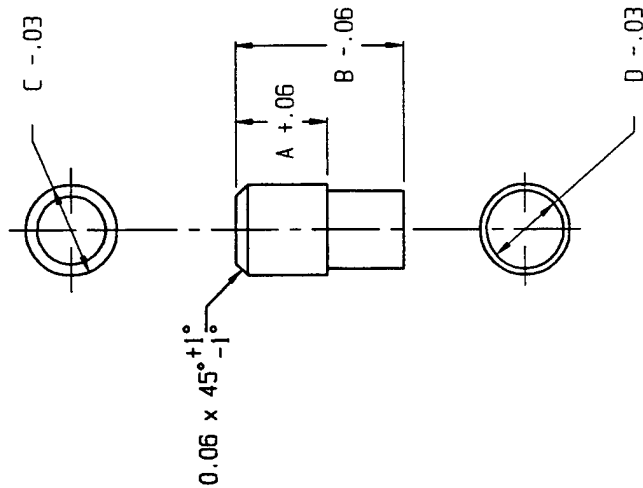
  

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES. SHARP CORNERS AND EDGES.		DATE 96-06-05 CHECKER BJK TJM MICHELS DESIGNED BY		DESIGN ACTIVITY U.S. ARMY INDUSTRIAL OPERATIONS COMMAND DEFENSE AMPLIFICATION CENTER AND SCHOOL SAVANNA, ILLINOIS 61074-0039	
TOLERANCES ON FRACTIONS $\pm .13$ DECIMALS $\pm .13$		SUBMITTED OTHER LIMITS INCLUDING OFFICE DIMENSIONS AND CONSTRUCTION COMMAND, U.S. ARMY INDUSTRIAL OPERATIONS COMMAND (IAC)		POST SUPPORT PLATE	
MATERIAL ACV00165 2.75 HYDRA ACV00164 ROCKET NEXT ASSY USED ON		SIZE C CAGE CODE 28620		ACV00307	
APPLICATION		SCALE 1/1		UNIT WT	
SHEET 1 OF 1		SHEET 1 OF 1		SHEET 1 OF 1	



NOTES:

1. ANSI Y14.5M-82 APPLIES.
2. MATERIAL: STEEL, 1018 OR 1020, PER ASTM A36.



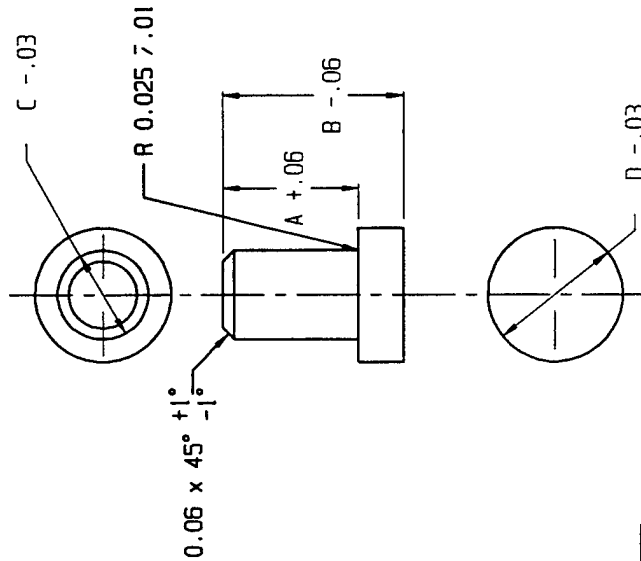
PART NO AC200000453-1  
PART NO AC200000453-2  
PART NO AC200000453-5

DIMENSION

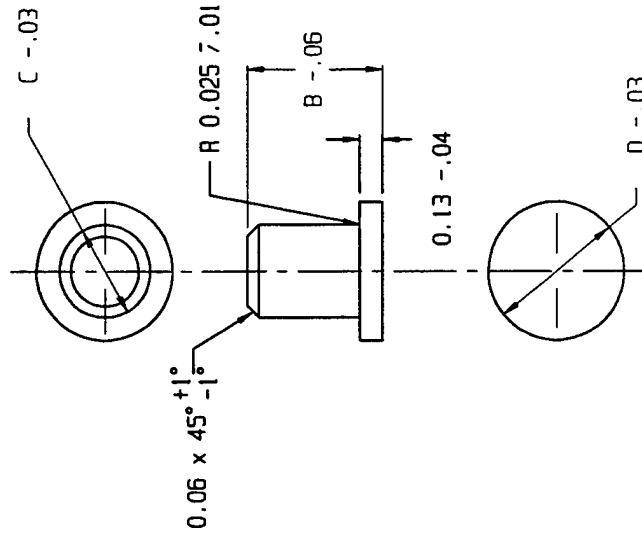
PART NO	A	B	C	D
AC200000453-1	.63	1.00	.50	.43
AC200000453-2	.50	.75	.31	.25
AC200000453-3	.75	1.00	.50	.75
AC200000453-4	N/A	.75	.31	.56
AC200000453-5	.63	.69	.37	.31

DISTRIBUTION STATEMENT A.

APPROVED FOR PUBLIC RELEASE;  
DISTRIBUTION IS UNLIMITED.



PART NO AC200000453-3



PART NO AC200000453-4

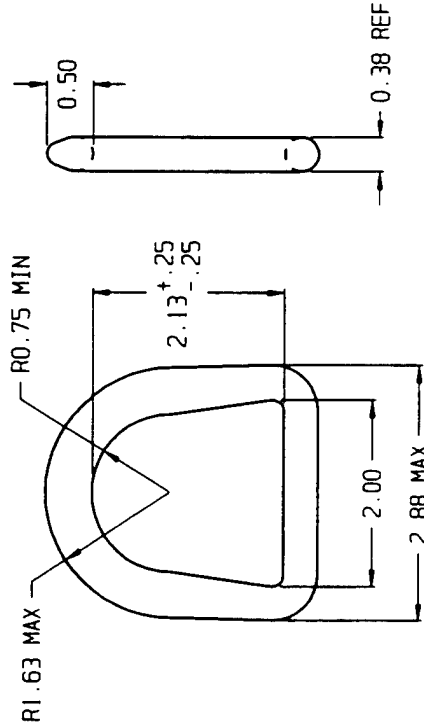
REVISION		
LTR	DESCRIPTION	DATE
-	PRODUCT BASELINE	89-04-10 TPT
A	ERR M8K9450	89-06-23 FRIED
B	NOR M913051 89-04-26	90-09-24 DREIER
C	ECP M913082-009 89-08-16	90-12-07 SCHULTZ
D	ECP M0A2201-001 90-10-19	92-07-20
E	NOR M214200 92-07-20	94-11-02 SCHULTZ
	(ECP M413005 94-06-02)	95-06-22
	NOR M5T3003 95-06-22	96-04-11

DESIGN ACTIVITY		U.S. ARMY ARMAMENT, MUNITIONS AND CHEMICAL COMMAND DEFENSE AMMUNITION CENTER AND SCHOOL SAVANNAH, ILLINOIS 61074-9639	
DATE	87-06-05	DESIGNER	T. J. MICHELS
BY	JG MJJ	CHECKED BY	W. F. ERNST
APPROVED BY	WM JK	APPROVED BY	JOHN L. BYRD, JR.
INLESS OTHERWISE NOTED, BREAK DIMENSIONS ARE IN INCHES. SHARP CORNERS AND EDGES.		MATERIAL	
FRACTIONS ON DECIMALS		1.03	
NEXT ASSY		USED ON	
APPLICATION		LUG- ALIGNING METAL PALLET	
SIZE		CAGE CODE	AC200000453
SCALE		2/1	UNIT WT
SHEET 1 OF 1			

# NOTES:

1. FRAME: 'D'-RING, 0.38 STOCK DIA, 4140 STEEL, 5,000# SAFE WORKING LOAD, ULTIMATE STRENGTH 13,000# OR GREATER.
2. PLATING: IMMERSION ZINC FLAKE/CHROMATE DISPERSION MIL-C-87115.
3. DIMENSIONS SHOWN ARE ENVELOPE DIMENSIONS NECESSARY FOR THE RING TO MATE WITH THE RING RETAINER AND TO PERFORM ITS INTENDED FUNCTION.
4. IDENTIFICATION OF THE SUGGESTED SOURCE(S) HEREON IS NOT TO BE CONSTRUED AS A GUARANTEE OF PRESENT OR CONTINUED AVAILABILITY AS A SOURCE OF SUPPLY FOR THE ITEM(S).

SUGGESTED SOURCES OF SUPPLY		
SUPPLIER DATA		
CAGE	PART NUMBER	NAME AND ADDRESS
16007	1070	U.S. FORGECAST CORP. P.O. BOX 387 FT. SMITH, AR 72902
6V480	204-115	HELGESEN INDUSTRIES, INC. 7261 HIGHWAY 60 WEST HARTFORD, WI 53027



## SPECIFICATION CONTROL DRAWING

REVISION			
LTR	DESCRIPTION	DATE	APPROVED
-	PRODUCT BASELINE ERR M9T3051	89-06-23	FRIEND
A	ECP M9T3082-005	89-08-16	90-09-24
B	ECP M9T3087-005	89-09-19	90-09-28
	NOR M2T4200	92-07-20	SCHULIZ
C	(ECP M0T4200	90-12-11)	
	(ECP M4T3005	94-06-02)	
D	NOR M5T3003	95-06-22	94-11-02
		96-04-11	SCHULIZ

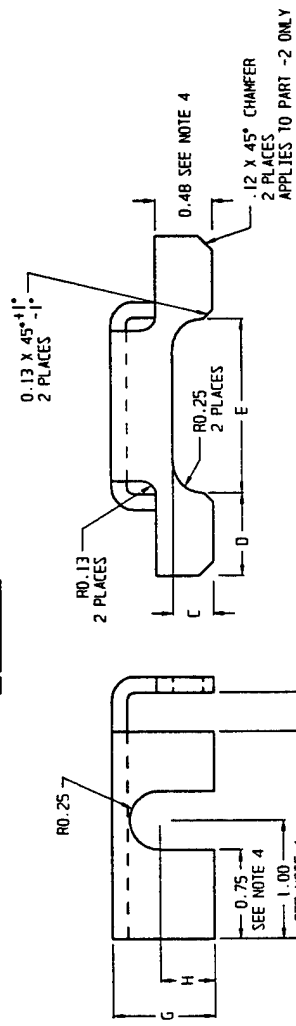
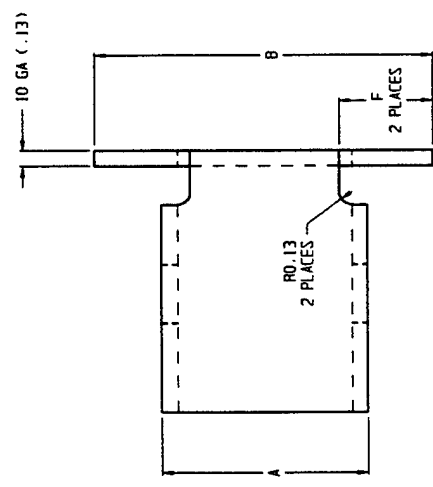
DESIGN ACTIVITY		U.S. ARMY ARMAMENT, MANUFACTURING AND CHEMICAL COMMAND DEFENSE APPLICATION CENTER AND SCHOOL SAVANNAH, ILLINOIS 61074-9630	
DATE		89-03-10	
DESIGNER	CHKD BY	DATE	DATE
JG	MJJ	03/10/89	03/10/89
WM	JK	T. J. MICHELS	
SUBMITTER		V. F. ERNST	
COMP. LABELING		COMP. LABELING	
APPROVED BY		APPROVED BY	
JOHN L. BYRO JR.		JOHN L. BYRO JR.	
SCALE		SCALE	
1/1		1/1	
UNIT		UNIT	
BT		BT	
SHEET		SHEET	
1 OF 1		1 OF 1	

### DISTRIBUTION STATEMENT A.

APPROVED FOR PUBLIC RELEASE;  
DISTRIBUTION IS UNLIMITED.

REVISION		DATE	APPROVED
1	PRODUCT BASELINE	89-08-23	FRLENO
2	ECR M73051	90-08-24	DRETER
3	ECR M73052-005	90-08-16	
4	NOR M74200	92-07-20	
5	ECR M73055	94-06-02	
6	NOR M73053	95-06-22	
7	ECR M73056	96-03-18	

- NOTES:
1. BEND RADIUS 0.06 INCH MAX WHERE NOT NOTED.
  2. ANSI Y14.5M-1982 APPLIES.
  3. MATERIAL: SHEET, SAE OR ANSI 1005-1010 STEEL, CARBON, COLD ROLL OR HOT ROLL, PER ASTM A568, (ASTM A366 OR A569).
  4. THESE DIMENSIONS MAY BE VARIED TO ACHIEVE THE ASSEMBLY OBJECTIVE DETAILED ON SHEET 2.
  5. DIMENSION SHOWN IS TO ACHIEVE A RING POSITION AT BEST WHICH IS BELOW THE TOP SURFACE OF THE PALLET, BUT ELEVATED TO READILY ACCEPT THE SLING HOOK.
  6. THIS DIMENSION IS TO BE ACHIEVED WHEN MATED WITH SIDE RAIL AND SQUARE BELL RESTRAINT. SEE NEXT ASSEMBLY DRAWING FOR ASSEMBLY DIMENSIONS.



C	C
SHEET 1	SHEET 2
REVISION STATUS OF SHEETS	

DESIGN ACTIVITY		DATE		89-03-13	
APPROVED, MANUFACTURING AND QUALITY CONTROL		DATE		89-03-13	
DESIGNED BY		DATE		89-03-13	
CHECKED BY		DATE		89-03-13	
DRAWN BY		DATE		89-03-13	
PART NAME		DATE		89-03-13	
PART NUMBER		DATE		89-03-13	
PART DESCRIPTION		DATE		89-03-13	
PART MATERIAL		DATE		89-03-13	
PART FINISH		DATE		89-03-13	
PART WEIGHT		DATE		89-03-13	
PART VOLUME		DATE		89-03-13	
PART COST		DATE		89-03-13	
PART LEAD TIME		DATE		89-03-13	
PART STOCK		DATE		89-03-13	
PART STATUS		DATE		89-03-13	
PART HISTORY		DATE		89-03-13	
PART COMMENTS		DATE		89-03-13	
PART APPROVAL		DATE		89-03-13	
PART SIGNATURE		DATE		89-03-13	
PART TITLE		DATE		89-03-13	
PART NUMBER		DATE		89-03-13	
PART DESCRIPTION		DATE		89-03-13	
PART MATERIAL		DATE		89-03-13	
PART FINISH		DATE		89-03-13	
PART WEIGHT		DATE		89-03-13	
PART VOLUME		DATE		89-03-13	
PART COST		DATE		89-03-13	
PART LEAD TIME		DATE		89-03-13	
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PART APPROVAL		DATE		89-03-13	
PART SIGNATURE		DATE		89-03-13	
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PART NUMBER		DATE		89-03-13	
PART DESCRIPTION		DATE		89-03-13	
PART MATERIAL		DATE		89-03-13	
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PART VOLUME		DATE		89-03-13	
PART COST		DATE		89-03-13	
PART LEAD TIME		DATE		89-03-13	
PART STOCK		DATE		89-03-13	
PART STATUS		DATE		89-03-13	
PART HISTORY		DATE		89-03-13	
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PART APPROVAL		DATE		89-03-13	
PART SIGNATURE		DATE		89-03-13	
PART TITLE		DATE		89-03-13	
PART NUMBER		DATE		89-03-13	
PART DESCRIPTION		DATE		89-03-13	
PART MATERIAL		DATE		89-03-13	
PART FINISH		DATE		89-03-13	
PART WEIGHT		DATE		89-03-13	
PART VOLUME		DATE		89-03-13	
PART COST		DATE		89-03-13	
PART LEAD TIME		DATE		89-03-13	
PART STOCK		DATE		89-03-13	
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PART TITLE		DATE		89-03-13	
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PART DESCRIPTION		DATE		89-03-13	
PART MATERIAL		DATE		89-03-13	
PART FINISH		DATE		89-03-13	
PART WEIGHT		DATE		89-03-13	
PART VOLUME		DATE		89-03-13	
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PART STATUS		DATE		89-03-13	
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PART STATUS		DATE		89-03-13	
PART HISTORY		DATE		89-03-13	
PART COMMENTS		DATE		89-03-13	
PART APPROVAL		DATE		89-03-13	
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PART FINISH		DATE		89-03-13	
PART WEIGHT		DATE		89-03-13	
PART VOLUME		DATE		89-03-13	
PART COST		DATE		89-03-13	
PART LEAD TIME		DATE		89-03-13	
PART STOCK		DATE		89-03-13	
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PART HISTORY		DATE		89-03-13	
PART COMMENTS		DATE		89-03-13	
PART APPROVAL		DATE		89-03-13	
PART SIGNATURE		DATE		89-03-13	
PART TITLE		DATE		89-03-13	
PART NUMBER		DATE		89-03-13	
PART DESCRIPTION		DATE		89-03-13	
PART MATERIAL		DATE		89-03-13	
PART FINISH		DATE		89-03-13	
PART WEIGHT		DATE		89-03-13	
PART VOLUME		DATE		89-03-13	
PART COST		DATE		89-03-13	
PART LEAD TIME		DATE		89-03-13	
PART STOCK		DATE		89-03-13	
PART STATUS		DATE		89-03-13	
PART HISTORY		DATE		89-03-13	
PART COMMENTS		DATE		89-03-13	
PART APPROVAL		DATE		89-03-13	
PART SIGNATURE		DATE		89-03-13	
PART TITLE		DATE		89-03-13	
PART NUMBER		DATE		89-03-13	
PART DESCRIPTION		DATE		89-03-13	
PART MATERIAL		DATE		89-03-13	
PART FINISH		DATE		89-03-13	
PART WEIGHT		DATE		89-03-13	
PART VOLUME		DATE		89-03-13	
PART COST		DATE		89-03-13	
PART LEAD TIME		DATE		89-03-13	
PART STOCK		DATE		89-03-13	
PART STATUS		DATE		89-03-13	
PART HISTORY		DATE		89-03-13	
PART COMMENTS		DATE		89-03-13	
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PART SIGNATURE		DATE		89-03-13	
PART TITLE		DATE		89-03-13	
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PART MATERIAL		DATE		89-03-13	
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PART VOLUME		DATE		89-03-13	
PART COST		DATE		89-03-13	
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PART STOCK		DATE		89-03-13	
PART STATUS		DATE		89-03-13	
PART HISTORY		DATE		89-03-13	
PART COMMENTS		DATE		89-03-13	
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PART SIGNATURE		DATE		89-03-13	
PART TITLE		DATE		89-03-13	
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## APPENDIX 60

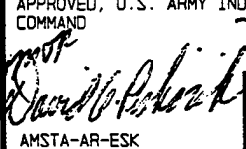
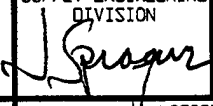
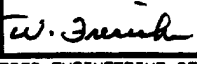
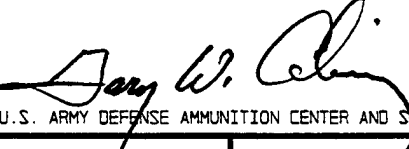

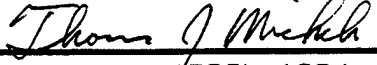
# UNITIZATION PROCEDURES FOR BOXED AMMUNITION AND COMPONENTS PACKED IN CYLINDRICAL METAL OR PLASTIC CONTAINERS ON 4-WAY ENTRY METAL PALLET

2.75" HYDRA ROCKET, PACKED 4 PER PA150  
CYLINDRICAL METAL CONTAINER, UNITIZED  
12 PER 78.50" X 29.31" SPECIAL METAL  
PALLET; APPROX CONTAINER SIZE 78.50" L  
X 9.25 W X 9.25" H

NOTICE: THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH  
THE BASIC UNITIZATION PROCEDURES DRAWING 19-48-4231-20PM1006.

DISTRIBUTION STATEMENT A.

APPROVED FOR PUBLIC RELEASE;  
DISTRIBUTION IS UNLIMITED.

U.S. ARMY MATERIEL COMMAND DRAWING			
APPROVED, U.S. ARMY INDUSTRIAL OPERATIONS COMMAND  AMSTA-AR-ESK      AMSIO-TMJ		DRAFTSMAN ENGINEER SUPPLY ENGINEERING DIVISION 	BETTY J. KUNDERT SANDRA M. SCHULTZ TRANSPORTATION ENGINEERING DIVISION 
APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND  U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL		VALIDATION ENGINEERING DIVISION  LOGISTICS ENGINEERING OFFICE  APRIL 1994	
REVISION NO. 1	MARCH 1996	CLASS 19	DIVISION 48
SEE THE REVISION LISTING ON PAGE 2		DRAWING 4231/ 60	FILE 20PM 1006

DO NOT SCALE

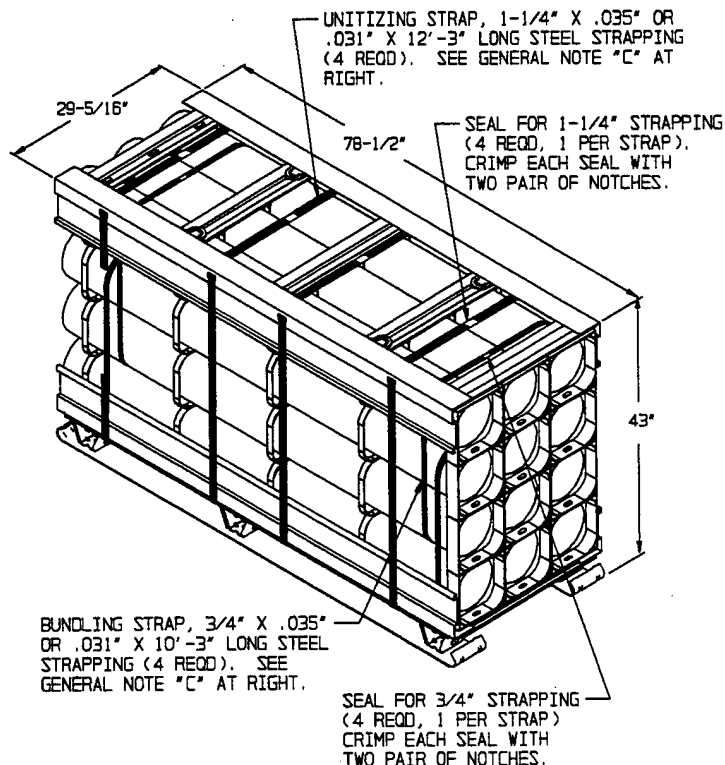
PALLET UNIT DATA				
ITEMS INCLUDED		HAZARD CLASS AND DIVISION ●		APPROX WEIGHT LBS
NSN	DODIC	DD CLASS	COMP GROUP	
1340-				
01-379-7814	H165			2,239
01-289-4719	H184			2,239
01-379-6347	H463	(04)1.2	G	2,239
01-379-7780	H463	(04)1.2	G	2,239
01-379-6350	H464	(09)1.2	E	2,239
01-379-7797	H464	(09)1.2	E	2,239
01-379-7889	H974	(04)1.2	G	2,239

- HAZARD CLASSIFICATION DATA CONTAINED IN THE ABOVE CHART IS FOR GUIDANCE AND INFORMATIONAL PURPOSES ONLY. VERIFICATION OF THE SPECIFIED DATA SHOULD BE MADE BY CONSULTING THE MOST RECENT JOINT HAZARD CLASSIFICATION SYSTEM LISTING OR OTHER APPROVED LISTING(S).

#### REVISION

REVISION NO. 1, DATED MARCH 1996, CONSISTS OF:

1. ADDING ITEM BY NATIONAL STOCK NUMBER TO "PALLET UNIT DATA" CHART.
2. CHANGING GENERAL NOTE "H" ON PAGE 3.
3. CHANGES IN ACCORDANCE WITH ECP MST3003.



#### PALLET UNIT

SEE GENERAL NOTE "B" AT RIGHT.

12 CONTAINERS OF 2.75 HYDRA ROCKETS (4 PER CONTAINER) AT 162 LBS	1,944 LBS (APPROX)
DUNNAGE	185 LBS
PALLET	110 LBS
<b>TOTAL WEIGHT</b>	<b>2,239 LBS (APPROX)</b>
<b>CUBE</b>	<b>57.3 CU FT (APPROX)</b>

#### BILL OF MATERIAL

METAL PALLET, 78.50" X 29.31"	1 REQD	-110 LBS
TOP ASSEMBLY	1 REQD	- 90 LBS
BOTTOM ASSEMBLY	1 REQD	- 85 LBS
STEEL STRAPPING, 3/4"	41.00' REQD	- 2.93 LBS
STEEL STRAPPING, 1-1/4"	49.00' REQD	- 7.00 LBS
SEAL FOR 3/4" STRAPPING	4 REQD	- NIL
SEAL FOR 1-1/4" STRAPPING	4 REQD	- NIL

#### GENERAL NOTES

- A. THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH THE BASIC UNITIZATION PROCEDURES DRAWING 19-48-4231-20PM1006. TO PRODUCE AN APPROVED UNIT LOAD, ALL PERTINENT PROCEDURES, SPECIFICATIONS AND CRITERIA SET FORTH WITHIN THE BASIC DRAWING WILL APPLY TO THE PROCEDURES DELINEATED IN THIS APPENDIX. ANY EXCEPTIONS TO THE BASIC PROCEDURES ARE SPECIFIED IN THIS APPENDIX.
- B. DIMENSIONS, CUBE AND WEIGHT OF A PALLET UNIT WILL VARY SLIGHTLY DEPENDING UPON THE ACTUAL DIMENSIONS OF THE CONTAINER AND THE WEIGHT OF THE SPECIFIC ITEM BEING UNITIZED.
- C. BUNDLING STRAPS MUST BE TENSIONED AND SEALED PRIOR TO THE APPLICATION OF THE UNITIZING STRAPS. BUNDLING STRAPS MUST ALSO BE INSTALLED AS CLOSE TO THE OUTER RINGS AS POSSIBLE, TO AVOID DAMAGE TO THE CONTAINER.
- D. ALTHOUGH THE CONTAINERS DEPICTED IN THE UNIT LOAD AT LEFT ARE CONSTRUCTED WITH INTERLOCKING DEVICES, THE INTERLOCKS WILL NOT FUNCTION PROPERLY UNLESS THE CONTAINERS ARE POSITIONED SO THAT THE "PINS" OF THE INTERLOCKS ARE FACING UPWARD. THIS ORIENTATION WILL AID IN THE PREVENTION OF CONTAINER MOVEMENT, BOTH LATEROALLY AND LONGITUOINALLY, DURING SHIPMENT OF THE UNIT LOAD.
- E. THE FOLLOWING AMC DRAWINGS ARE APPLICABLE FOR OUTLOADING AND STORAGE OF THE ITEMS COVERED BY THIS APPENDIX.
 

CARLOADING	19-48-4242/60-5PM1004
TRUCKLOADING	19-48-4243/60-11PM1004
STORAGE	19-48-4250-1-2-3-4-14-22PM1004
END OPENING ISO	
CONTAINER	19-48-4245/60-15PM1009
MILVAN	19-48-4244/60-15PM1008
SIDE OPENING ISO	
CONTAINER	19-48-4272/60-15PM1016
- F. FOR METHOD OF SECURING A STRAP CUTTER TO THE PALLET UNIT, SEE AMC DRAWING 19-48-4127-20P1000.
- G. IF ITEMS COVERED HEREIN ARE UNITIZED PRIOR TO ISSUANCE OF THIS APPENDIX, THE CONTAINERS NEED NOT BE REUNITIZED SOLELY TO CONFORM TO THIS APPENDIX.
- H. FOR DETAILS OF THE PALLET AND PALLET ADAPTERS, SEE AMCCOM DRAWING ACV00156, MIL-A-70788 AND MIL-P-70786.
- J. THE UNITIZATION PROCEDURES DEPICTED HEREIN MAY ALSO BE USED FOR UNITIZING 2.75" HYDRA ROCKETS WHEN IDENTIFIED BY DIFFERENT NATIONAL STOCK NUMBERS (NSN) THAN WHAT IS SHOWN ON PAGE 2, PROVIDED THE CONTAINER PACK DOES NOT VARY FROM WHAT IS DELINEATED HEREIN. THE EXPLOSIVE CLASSIFICATION OF OTHER ITEMS MAY BE DIFFERENT THAN WHAT IS SHOWN.
- K. EMPTY OR REJECT PA150 CONTAINERS WILL BE USED AS FILLER CONTAINERS AS NECESSARY. FILLER CONTAINERS MUST BE INSTALLED IN THE MIDDLE OF THE TOP LAYER(S) OF CONTAINERS. IF FOUR FULL CONTAINERS ARE TO BE OMITTED, ONE FULL LAYER OF CONTAINERS WILL BE OMITTED. WHEN (REJECTED) FILLER CONTAINERS ARE USED IN PLACE OF OMITTED CONTAINERS TO COMPLETE A LAYER ON A PALLET, THEY WILL BE MARKED AS SPECIFIED WITHIN MIL-STD-129-1, EXCEPT WHEN (EMPTY/REPAIRABLE) CONTAINERS ARE USED IN PLACE OF OMITTED CONTAINERS TO COMPLETE A LAYER ON A PALLET; THE WORD "EMPTY" WILL BE STENCILED IN ORANGE ON THE EMPTY CONTAINER IN 1-INCH SIZE LETTERS. THE WORD "EMPTY" WILL BE STENCILED TWICE ON THE OPEN END PORTION OF THE CONTAINER WITH THE WORDS PAINTED ALONG THE CIRCUMFERENCE, 180 DEGREES APART, AND THREE TIMES ON THE BODY PORTION OF THE CONTAINER WITH THE WORDS PAINTED LENGTHWISE ON THE CONTAINER AND SPACED 120 DEGREES APART AS MEASURED AROUND THE CONTAINER CIRCUMFERENCE.
- L. FOR DETAILS OF THE PA150 CONTAINER SEE PICATINNY DRAWING 12937856-2.

